As the demands of pharmaceutical and nutriceutical industries for *G. frondosa* biomass are constantly increasing, submerged cultivation in bioreactors on liquid substrates has been developed recently for small and pilot-plant production of intra- and extracellular polysaccharides.

In our work, *G. frondosa* biomass and its pharmaceutically active polysaccharides were produced by submerged cultivation in a liquid medium in two ways: (1) in 250 mL Erlenmayer flasks, containing 50 ml of substrate, on a shaker, and (2) in a 10-L stirred tank bioreactor. The Slovenian isolate of *G. frondosa* (GF3, Fungal bank of the Biotechnical faculty, Department of Wood Science and Technology, University of Ljubljana, Slovenia) was used in all experiments.

In the production of *G. frondosa* mycelium biomass, Erlenmayer flasks were incubated at 29°C on a shaker at 216 rpm. After 30 days of cultivation in Erlenmayer flasks, 1.8 g of fresh biomass (36 g/L) or 0.9 g of dry biomass (18 g/L) was obtained. The yield of total polysaccharides was 2.9 g/L of the liquid medium.

Optimal growth conditions in a 10-L stirred tank bioreactor were: temperature 28°C, air flow 5 L/min, mixing speed 220 rpm. After 60 days of cultivation in a 10-L bioreactor, the amount of isolated fresh biomass was 307.7 g (30.8 g/L), which corresponded to 167 g of dry biomass (16.7g/L), respectively. Extracellular polysaccharides (3.64 g) were isolated from the mycelium (21.8 mg/g of dry biomass) and 1.29 g of dry intracellular polysaccharides (7.7 mg/g of dry biomass), respectively. Isolated polysaccharides were separated by ion-exchange chromatography on DEAE cellulose, gel chromatography on Sepharose 4B, and affinity chromatography on Concavalin A - Sepharose 4B. Five fractions of extracellular β-D-glucans were obtained, with a total mass of 6.7 mg (40.1 μg/g dry biomass or 4.0 μg/L liquid substrate) and two fractions of intracellular β-D-glucans with a total mass of 4.9 mg (29.3 μg/g dry biomass or 0.5 μg/L liquid substrate).

The above experimental results confirmed that *G. frondosa* biomass can be successfully produced by submerged cultivation on synthetic media. Submerged cultivation was suitable for the production of fungal polysaccharides, including β-D-glucans, which are the most important active compounds of *G. frondosa*.

The Chemical Composition of the Fruiting Bodies of Selected *Lentinus edodes* Strains

Nina A. Bisko,[1] Valentina I. Fomina,[2] Nadezda Yu. Mitropolskaya,[1] and Victor T. Bilay[1]

[1]M. G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, Kiev, 2 Tereshchenkivska St., Kiev, GSP-1, 01601, Ukraine; [2]Institute of Forest, National Academy of Sciences of Belarus, Gomel, Belarus

The investigation of fructification peculiarities and productivity of 51 strains of *Lentinus edodes* (Berk.) Singer (Shiitake mushroom) on sterilized mixture which consisted of oak sawdust and wheat bran (4:1) was conducted. Seven strains were selected, which had high yields (49%–54%) and biological effectiveness (120%–125%) on this substrate. The possibility of using oak, ash tree, alder, and birch sawdust as substrate for the spawn production was studied. It was demonstrated that the full consumption of the above mentioned kinds of sawdust as well as wheat grain was observed in 16–20 days. The yield of shiitake using oak–ash tree spawn was 27%–29%, alder spawn – 22%–28%, birch spawn – 19%–24%, and grain spawn – 24%–26% for 60 days. The fruiting bodies of selected strains were analyzed. The considerable strain variability of the crude protein content was demonstrated (see Table 1).

For example, the content of crude protein in the fruiting bodies of strain 368 was higher by 15.7%

Table 1. Chemical Composition of Fruiting Bodies of *L. edodes* Strains

	The content, % a.d.m.			
Strain	**Crude protein**	**Carbohydrates**	**Phosphorus**	**Potassium**
353	54.38	1.98	2.32	3.37
364	47.00	1.55	1.89	3.01
365	48.90	1.64	2.27	3.43
368	55.75	1.24	2.12	2.81
371	49.00	1.33	1.92	3.12
374	51.44	2.38	1.86	3.01
381	53.19	1.32	2.16	2.76

than in fruiting bodies of strain 364. Fruiting bodies of strains 368, 381, and 353 were characterized as having the highest quantity of crude protein (see table) and surpassed the amounts described in literature. Strain variability on the content of carbohydrates, phosphorus, and potassium in investigated fruiting bodies was significant, too. Also, the content of carbohydrate in the fruiting bodies of strain 374 was higher by 47.9% than in fruiting bodies of strain 368 (see Table 1).

Thus, seven high productive shiitake strains for cultivation on wastes from the forest industry with the addition of wheat bran, which are widespread in the Ukraine and Belarus, were selected. It was demonstrated that oak, ash tree, alder, and birch sawdust may be used as substrates for the cultivation of shiitake spawn.

Mushrooms Cultivation with the Aim at Developing and Maintaining Psycho-Physical Abilities of Mentally Disabled People

Irena Borštnik

CUDV Draga, 1 Draga, 1292 IG, Slovenia

This study is based on the development of oyster mushroom cultivation as part of the Green Program in Center Draga, Slovenia (center for qualifying, work, and care for mentally disabled people), from its beginning, 10 years ago. Many positive effects of the program on our clients were observed such as stimulation and providing conditions for development of oyster cultivation like it is today. The goals of this work were to search for new activities, which would additionally stimulate the potentials of our clients. We used advantages and the knowledge we had at that time—the Center owned a big unexploited place. The methods used made it possible to evaluate the interaction between the working tasks and clients abillities. We developed concepts of activities and technological phases. With a qestionary (individual interviews using photos), we compared their preferences according to other activities in the Green program.

The process of growing oysters appeared to be a good motivational factor, at developing and maintaining the psycho-physical abilities of this population. Personal features and speciality of the people with mental distrubance demand special, adapted manners of gualification and work. The process of oysters growing on wheat straw, satisfied the majority of these special needs. For example, individual phases of cultivation are rather simple, the results of their work are received soon enough, and last but not the least, the production is very tasty.

On the one hand, the quality and quantity of the harvest are important from economic point of view and as motivational factors, but they were not among the goals and objectives of the study. On the other hand, we noticed that this work, affected very well a cartain population of clients. For some of them, that was only a positive experience. Their abillities but not deficiency, accessed expression, which contributed to their positive self-image.

Regarding the positive effects and also the critical avaluation according to the activity, we formed a concept of idividual technological phases and methods of work. The concept was based on the adaptation to the working place, working time, technologies, and methods of work as well as to the available number of professional staff and their working scheduals.

Mushrooms cultivation, as part of the Green Program, is part of a formal special educational program for work and work activities in the Center CUDV Draga, for children, adolescents, and adults with moderate, severe, and profound deficiencies in mental development.